

# (12) UK Patent Application (19) GB (11) 2 252 847 (13) A

(43) Date of A publication 19.08.1992

(21) Application No 9103357.1

(22) Date of filing 18.02.1991

(71) Applicant  
GEC Avery Limited

(Incorporated in the United Kingdom)

Smethwick, Warley, West Midlands, B66 2LP,  
United Kingdom

(72) Inventor  
John Frederick Charles Baker

(74) Agent and/or Address for Service  
GEC Patent Department  
Marconi Research Centre, West Hanningfield Road,  
Great Baddow, Chelmsford, Essex, CM2 8HN,  
United Kingdom

(51) INT CL<sup>5</sup>  
G05B 19/405, F02D 45/00

(52) UK CL (Edition K)  
G3N NG1A4 N288A N402A N403 N404  
G4A AAP  
U1S S1820 S1990

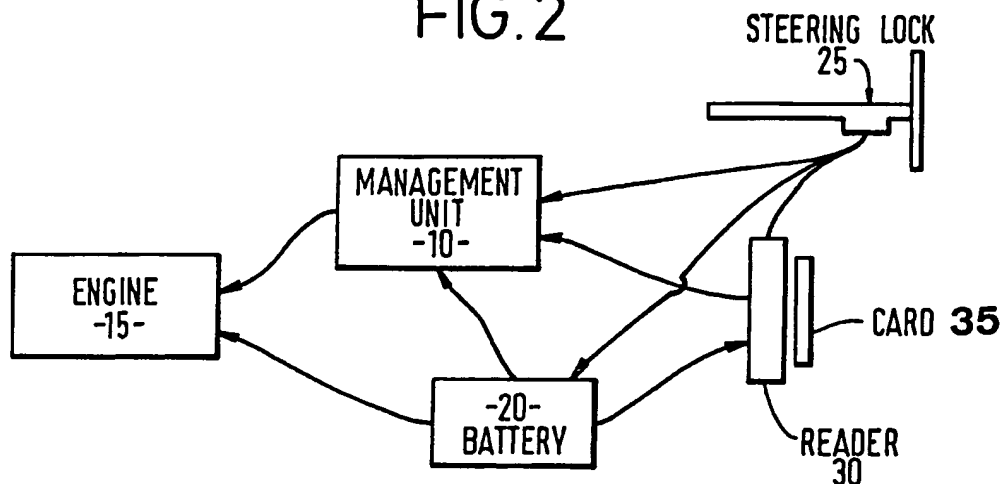
(56) Documents cited  
GB 2224373 A GB 2209613 A EP 0276629 A  
EP 0229540 A EP 0217668 A WO 84/03785 A1

(58) Field of search  
UK CL (Edition K) G3N NGBC2 NGBD NGBD1  
NG1A4 NG1A9 NG1B, G4A AAP  
INT CL<sup>5</sup> F02D, G05B

## (54) Secure vehicle control

(57) An electronic engine management system comprises a first microprocessor for controlling engine function, and a removable token such as a contactless smart card having an electronic memory element included therein and optionally a further microprocessor. Interface means is provided between the token memory and the first microprocessor which may comprise a further microprocessor. At least part of the information required by the first microprocessor (eg programming or data) for controlling engine function is held in the token memory. Therefore the vehicle cannot be operated without the token, even if the token reader is short-circuited.

FIG. 2



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

BEST AVAILABLE COPY

GB 2 252 847 A

FIG. 1

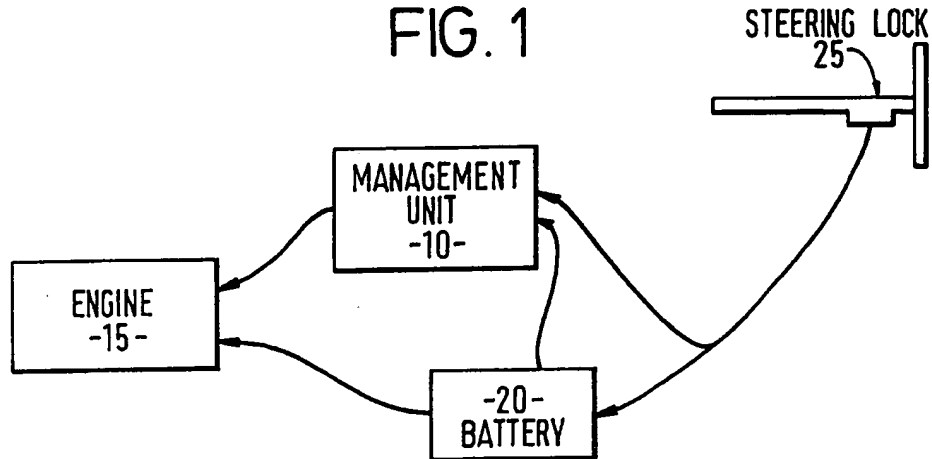
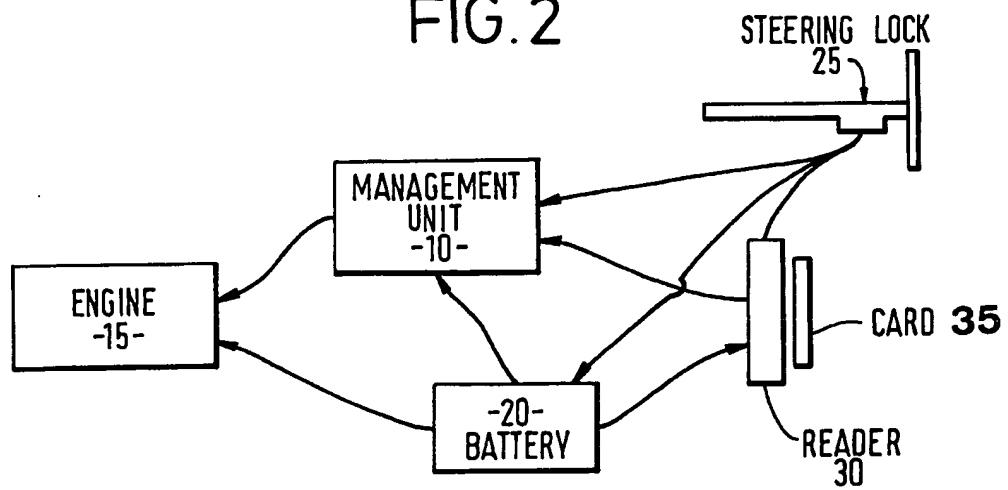


FIG. 2



- 1 -

ENGINE MANAGEMENT SYSTEM

The present invention relates to an electronic engine management system which includes a microprocessor for controlling engine function.

Electronic management systems have been previously proposed for internal combustion engines which utilise a microprocessor to control various aspects of engine function. Such systems have found particular applicability in automobiles having spark ignition engines and often electronic fuel injection, electronic ignition etc. It is usually the case that if the electronic management system is inoperative then the engine will not function and the car cannot be driven. Enabling and disabling of the system is normally achieved using a simple mechanical key such as might be found in most automobiles functioning an ignition and starter motor switch and often a steering lock key. However, the key and lock can be bypassed by detaching the appropriate wires for ignition and starter motor function and a steering lock can be physically removed. Thus the car can be driven even if the key is not available which means that the car can be stolen easily.

- 2 -

The digital programming of an engine management microprocessor offers an opportunity to enhance vehicle security which has not been exploited to date to any great extent.

According to one aspect of the present invention there is provided an electronic engine management system comprising a control unit including a microprocessor for controlling at least one engine function in accordance with a control program, a removable token having a non-volatile electronic memory element included therein, and interface means whereby data may be passed from the token to the microprocessor, wherein data representing a part of the control program is held in the token memory element.

Conveniently, the information held in the token memory is loaded into volatile memory in the first microprocessor such that the information is lost when the engine is switched off.

The token typically includes a microprocessor as well as the memory element. It is particularly preferred that a contactless integrated circuit card is used which communicates using inductive coupling at radio frequencies.

- 3 -

The interface may also contain a microprocessor for controlling the transfer of information from the token to the first processor.

A system according to the present invention has the advantage that it can be used to provide a further level of security when installed in an automobile which cannot be simply bypassed by physical means.

An example of the present invention will now be described with reference to the accompanying drawing, in which:-

Figure 1 shows a schematic diagram of a conventional engine management arrangement; and

Figure 2 shows a schematic diagram of a system according to one embodiment of the invention with parts omitted for clarity.

Referring now to Figure 1, the system shown comprises a management unit 10, an engine 15, a battery 20 and a steering lock/ignition key arrangement 25. The key arrangement 25 serves as a master switch for power from the

- 4 -

battery 20 to the electrical components of the system such as the starter motor and ignition system. The management unit serves to control the electrical aspects of engine function when power is supplied. Typical controlled functions are ignition timing, advance/retard, and electronic fuel injection timing and quantity. However, this system has the disadvantage that it will still function if the key arrangement 25 is bypassed and the appropriate electrical connections made. The present invention is intended to overcome this problem by utilising the digital program nature of the management unit.

Referring now to Figure 2, the system shown therein differs from that described above in that the management unit 10 is connected to a reader unit 30 which can communicate with a removable smart card 35. These are preferably a contactless card and reader which communicate by inductive coupling and may typically be as described in GB2173523. However, other types of contact or contactless cards and readers may be applicable according to requirements. The card 35 include a microprocessor and a memory unit as well as the required structures for communicating with the reader 30. In the present case, the reader 30 and the card 35 both contain loop aeriels. The reader unit transmits data to the card by means of RF

- 5 -

signals at sufficient power that when the card 35 is within range, the appropriate power to drive the electrical components contained therein is obtained from the signal induced in the card loop aerial by the data from the reader. Data is communicated from the card to the reader by varying the level of power consumed by the card aerial and components, which variation can be monitored at the reader 30.

The contactless arrangement described has a particular advantage in automobile applications in that it is not affected by vibration to the same extent as a physical contact type card might be where contacts might be disconnected or displaced by vibrations due to movement.

The power for the reader 30 is drawn from the battery 20 or the engine generated electricity supply when running, and so can be under ultimate control of the ignition key arrangement 25. However, a portion of the data required by the management unit 10 can be held in the card memory so that the management unit 10 cannot control the engine 15 until the card 35 is present. This can be achieved because the management unit is digitally programmed and so it is easy to locate part of the program in the card memory and provide the management unit with programming to allow it to

- 6 -

communicate with the card 35.

In one embodiment the programming of the management unit is simple and merely requires data to be loaded into volatile memory therein before it will function. In this case a microprocessor would be included in the reader 30 to control data flow to and from the card. It is also possible that the management unit processor could be programmed to control the reader function.

The data transferred from the card might be a simple i.d. code, basic settings or signals to start the engine or might be control information which must be accessed continually during use. This would prevent the card 35 from being removed once the engine was started. For security purposes, each management unit/card combination may store different parts of the control information or program in the card memory, so that a card from one vehicle cannot be used to operate another vehicle having a similar engine management system.

CLAIMS

1. An electronic engine management system, comprising a control unit including a microprocessor for controlling at least one engine function in accordance with a control program, a removable token having a non-volatile electronic memory element included therein, and interface means whereby data may be passed from the token to the microprocessor, wherein data representing a part of the control program is held in the token memory element.
2. An engine management system as claimed in claim 1, wherein, in use, the data held in the token memory is loaded into volatile memory in the control unit.
3. An engine management system as claimed in claim 1 or 2, wherein the token includes a microprocessor.
4. An engine management system as claimed in claim 3, wherein the token is a contactless token which communicates with the interface using inductive coupling at radio frequencies.
5. An engine management system as claimed in any preceding

- 8 -

claim, wherein the interface contains a microprocessor for controlling the transfer of information from the token to the control unit.

6. An engine management system as claimed in any preceding claim, wherein the data stored in the token memory element is such that the control unit must repeatedly receive the data driving the operation thereof, whereby the engine cannot operate in the absence of the token.

7. An engine management system, substantially as described with reference to Figure 2.

**tents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

91

**Relevant Technical fields**

- (i) UK CI (Edition K ) G3N (NGIA4, NGIA9, NG1B,  
 NGBD, NGBD1, NGBC27,  
 G4A1AAP)
- (ii) Int CI (Edition 5 ) G05B, F02D

**Search Examiner**

Dr E P Plumme

**Databases (see over)**

(i) UK Patent Office

(ii)

**Date of Search**

20 May 1991

Documents considered relevant following a search in respect of claims

ALL

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2224373 A FUJI pages 5, 7, 8	1 at least
X	GB 2209613 A MOLINS nb. page 2 lines 2 to 5	" "
X	EP 0276629 A FRITZ GEGAUF whole document	1,3 at least
X	EP 0229540 A S E N S whole document	1 at least
X	EP 0217668 A NINTENDO whole document	1,3 at least
X	WO 84/03785 A1 ERNST whole document	1 at least

SF2(p)

TPLABX

Category	Identity of document and relevant passages	Relevant to claim(s)

#### Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

**Databases:** The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**